Analysis for investment in new technologies

What types of new economic analysis are being required by product (incl. public health interventions) developers?

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TB-MAC annual meeting October 2nd, 2019



Hierarchy of Evidence(data) in Public Health(used in models)



Hierarchy of Evidence – in the era of SDGs



Is it sustainable and scalable?

Is it worth it?

Does it work in practice?

Can it work?

Jarvinen et al., BMJ 2011

The reality



How comparable are these results?

Lu et al., PlosONE, 2013

Dimensions of value-drivers in public health?



Interventions



Illustration by H. Sohn 2019

How technologies can improve the process innovation

Program components & technological needs

Technological innovation needed for each ACF program components



Types of strategies and activities for each ACF program components

- Community awareness campaigns
- Door-to-door screening
- Contact investigation
- Symptom screening
- (Mobile) Chest Radiograph (CXR)
- Intensified clinic-based case-finding

- Sample transport assistance
- Link local TB laboratories (smear and/or Xpert)
- Use of mobile Xpert (mobile laboratory)

- Strengthening patient follow-up
 process
- Patient management program tools
- Providing direct referrals and management of patients until treatment initiation

- Medication Event Monitoring Systems
 (MEMS) e.g. 99 DOTS
- Patient management programs to minimize losses to follow-up
- Financial assistance programs
- Periodic in-person visits to patient households

The process of how costs are determined is complex



Other Factors (analytical & financial)

- Currency
- Discount Rate
- Expected useful Life Years (ELY)
- Financial vs. Economic costs

At what price...?

20%

LTBI prevalence



Clinical Infectious Diseases

MAJOR ARTICLE



Cost-effectiveness of Preventive Therapy for Tuberculosis With Isoniazid and Rifapentine Versus Isoniazid Alone in High-Burden Settings

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Patient adherence to regimen: programmatic outcome



Multi-disciplinary approach to valuation

What is the value of getting Xpert closer to patients?





Model of diagnostic & treatment algorithm

Model components

Cost model: Decentralized Xpert

Indicators	λ 0.1	λ 0.2	λ 0.3	λ 0.5	λ 0.7	λ1	λ2	λ3	λ4	λ5	λ6	λ7	λ8	λ9	λ 10	
indicators	Test volume statistics															
Average # Samples / Day	0.1	0.2	0.3	0.5	0.7	1.1	1.9	3	3.9	5.1	5.8	7	7.9	8.9	10.2	
Highest daily workload	1	2	2	2	3	4	6	7	9	10	11	13	13	16	18	
Lowest daily workload	0	0	0	0	0	0	0	0	0	1	2	2	3	3	4	
Total # of patients tested (annual)	27	51	64	121	163	263	469	752	973	1277	1456	1739	1986	2234	2554	
Range (Low)	0	40	58.5	93.5	143	214	367	611.5	863.5	1126	1367.5	1598.5	1863.5	2111	2395	
Range (High)	39	57.5	92.5	142	213	366	610.5	862.5	1125	1366.5	1597.5	1862.5	2110	2394		
		Calculating # of Omni modules required (90% same day turn-around guarantee)														
Frequency beyond 4 tests per day	0	0	0	0	0	0	10	41	83	150	173	227	241	238	247	
Frequency beyond 8 tests per day	0	0	0	0	0	0	0	1	7	14	35	66	100	127	175	
Frequency beyond 12 tests per day	0	0	0	0	0	0	0	0	0	0	0	6	12	44	53	
% same day coverage with 1 Omni/Edge	100%	100%	100%	100%	100%	100%	96%	84%	67%	40%	31%	9%	4%	5%	1%	
% same day coverage with 2 Omni/Edge	NA	NA	NA	NA	NA	NA	NA	100%	97%	94%	86%	74%	60%	49%	30%	
% same day coverage with 3 Omni/Edge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100%	98%	95%	82%	79%	
# of Omni Units Required	1	1	1	1	1	1	1	2	2	2	3	3	3	4	4	
	<i>Cost Estimates</i>															
Annual EQA cost (PE)	\$115	\$115	\$115	\$115	\$115	\$115	\$115	\$231	\$231	\$231	\$346	\$346	\$346	\$461	\$461	
Total Cost (PE)	\$1,642	\$1,967	\$2,147	\$2,916	\$3,482	\$4,804	\$7,496	\$14,394	\$17,694	\$21,971	\$30,085	\$34,353	\$37,704	\$48,910	\$52,892	
% EQA	7%	6%	5%	4%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	
Average Cost / Test	\$60.81	\$38.58	\$33.55	\$24.10	\$21.36	\$17.83	\$15.98	\$19.14	\$18.19	\$17.20	\$20.66	\$19.75	\$18.98	\$21.89	\$20.71	

Cost Model: Centralized Xpert



Calculate cost difference between CXP vs. DXP



Cost per DALY averted, decentralized Xpert



- Cost-effectiveness (utility) depends highly on:
 - Current practice (centralized testing) and costs of sample transport
 - Ability to reduce pre-treatment loss to follow-up
 - Use of Xpert testing capacity (higher costs if capacity is not adequately utilized)
- Financial and operational commitment for decentralization a big hurdle in low resource settings (not answered by CEAs)
 - Procurement and supply system for cartridge and key laboratory consumables
 - Training, QA/QC, equipment maintenance, EQA and performance monitoring systems

Key take away message – Xpert decentralization



Costs of process that we've been ignoring

Figure 1. Simplified illustration of stages of public health program implementation, activities at each stage, and cost data structure

Alternative ways to think about value

Can we justify incremental cost of a diagnostic test?



Can countries self-finance expensive novel diagnostic tests?

Illustration by H. Sohn 2019

Early engagement is critical!



Design of costing studies tailor to the key research question

Ask the right questions \rightarrow Determine the perspectives of evaluation \rightarrow Use standardized methods and tools to collect and report costing data

